Reviewer's report

Title: Quantitative T2 mapping to characterize the process of intervertebral disc degeneration in a rabbit model

Version: 1 Date: 9 October 2013

Reviewer: Gwendolyn Sowa

Reviewer's report:

This is an important manuscript that describes the utility of T2 mapping for assessing the intervertebral disc. The topic of the manuscript would be of great interest to the spine community. However, the data as currently presented makes only a small incremental advance over existing knowledge on the topic. The authors cite the relationship that is already established between T2 and water and proteoglycan. While they add an analysis of collagen gene expression, the significant novel contribution is not stressed by the authors and should be expanded.

Other major essential revisions:

The authors make the claim that T2 is more sensitive. However, they do not present the data on Thompson grading over time to demonstrate that this is in fact the case. The Thompson grading for each timepoint should be included in Figure 3.

Similarly, it is not clear from the results what timepoint corresponded to the percentage of discs of each grade.

The authors should also present analogous correlations with Thompson grading with gene expression to again be able to make the case that T2 is better, particularly since there is clearly a relationship between T2 and Thompson grading (Figure 2).

The discussion of the utility of T2, in particular the development of a quantification scale, is largely speculative and should be modified.

It is not clear why 20 rabbits were selected randomly from the 35 animals used in the study. Why were all 35 not used, and how was the selection accomplished?

A limited number of matrix genes were examined, and this should be cited as a limitation of the study.

Minor Essential REvisions:

The abstract refers to sham controls, however, these are more internal controls than shams.

The methods section of the abstract should include a brief description of the statistical analysis, in more detail than "were studied".
The conclusion in the abstract suggests that T2 can be used to determine the timing of treatment, which was not evaluated in the current study. Therefore, this should be deleted.

It should be explained how corresponding images were chosen for analysis—were all images analyzed mid-sagittal, and how was this identified.

It should be described how consensus was obtained between two individuals reading the images.

The method of gene expression analysis should be noted—it is assumed from the graphs that this was calculated as relative gene expression, but this is not described.

The discussion mentioned collagen orientation, however, no assessment was done in regards to orientation, so this should be removed.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interests